Fluorescent Chrysotile From Sterling Hill, New Jersey

James A. Van Fleet
Bucknell University, vanfleet@bucknell.edu

Earl R. Verbeek
Sterling Hill Mining Museum

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INTRODUCTION

Minerals of the serpentine group, notably chrysotile and to a lesser extent lizardite, are widely present at both Franklin and Sterling Hill. They are late-stage hydrous magnesium silicate minerals that formed by hydrothermal alteration of earlier species, among them willemite and tephroite, and are also common components of hydrothermal veins cutting the orebodies and the enclosing marble (Dunn, 1995). Although long recognized in the area (Fowler, 1825), local serpentine was not documented as a fluorescent mineral until 2004, when a brief description of a fluorescent serpentine from Franklin appeared in The Picking Table (Cianciulli, 2004). In the present paper, we describe additional examples of fluorescent serpentine, most from Sterling Hill.

ANALYTICAL TECHNIQUES

The general appearance of local serpentine under a loupe (pale to dark brown color, resinous luster, exceedingly fine grain size, no cleavage, irregular to conchoidal fracture) are useful clues to its identity. Unless otherwise indicated, however, all serpentine samples discussed in this paper have been confirmed as such by X-ray diffraction (XRD). The instrument used was a Philips (now PANalytical) X’Pert Pro MPD powder diffractometer with a Cu K-alpha radiation source. X-ray settings were 45 kV and 40 mA. The analysis software used was X’Pert Highscore, which matches the resulting diffraction peaks to mineral IDs in an internal library. In all specimens X-rayed to date, the serpentine has proved to be chrysotile.

TWO EXAMPLES FROM STERLING HILL

On May 7, 2004, one of us (ERV) recovered a specimen of fluorescent serpentine, not then recognized as such, from a boulder that had been excavated the day before by John Kolic from the footwall of the east limb of ore along the west wall of the fill quarry at Sterling Hill, about 50 ft south of the ore pillar. Approximate mine coordinates for this occurrence are 540 N, 1500 W. The specimen consists of an irregular vein...
0.6 to 1.7 cm thick of fibrous, dark gray to greenish-brown calcite from a fault opening in lean, medium-gray, granular franklinite-calcite ore. The vein material was noted to fluoresce dim, pale yellow under longwave (LW) ultraviolet (UV) light, a response in strong contrast to the moderately bright, orange-red fluorescence of the host rock. Both responses were, at the time, attributed to calcite. Also noted in the rock were scattered rusty-looking grains of a mineral that resembled willemite but showed no fluorescence, and was tentatively identified as serpentinized willemite or an altered humite-group mineral. The fault zone from which this specimen came is well exposed along nearly the entire length of the west wall of the fill quarry and consists of multiple irregular fault strands of shallow dip. At least two phases of movement have occurred along this fault zone, the second of which is recorded by the fibrous calcite noted above.

Several years later, in 2008, Mark Boyer recovered additional specimens from this same occurrence, one of which was subsequently X-rayed by JVF. The XRD data showed the vein material to be a mixture of calcite and chrysotile; a representative example is shown in Figures 1 and 2. Dissolution of the calcite component in dilute hydrochloric acid left a residue that fluoresces identically to the vein material, revealing the source of its fluorescence to be the chrysotile, rather than calcite as originally supposed. Additional chrysotile forms thin coatings on fracture surfaces in some of the specimens collected by Mr. Boyer, and these too show a pale yellow fluorescence under LW UV (Figs. 3 and 4). Numerous specimens exist from this find and are now widely dispersed among collectors. One such specimen is currently (2013) in the fluorescent displays of the Franklin Mineral Museum.

A second find of fluorescent chrysotile dates from the spring 2009 digs at Sterling Hill, when collectors removed specimens of fluorescent calcite intergrown with dolomite (the material locally nicknamed “crazy calcite”) from a large boulder in the Passaic Pit. Under SW ultraviolet light, these specimens show the typical intricate intergrowth of red-fluorescent calcite and nonfluorescent to weakly fluorescent dolomite, but some contain multiple layers that show no fluorescence. These layers, in daylight, are of dark appearance and contain more franklinite than the adjacent rock. Longwave UV revealed the rock also contained sphalerite, both as disseminated grains and as heavier concentrations in the dark, franklinite-rich layers. In several specimens collected, an additional mineral, one that fluoresces weak greenish-yellow LW, was noted in these same layers.

Examination with a 14× loupe revealed that the yellow-fluorescing mineral was amber brown in daylight, in anhedral grains with a resinous luster. A steel dental tool was used to scrape some of this material from the surface of the rock to provide a sample for X-ray determination. The resulting scan revealed the presence of calcite, dolomite, sphalerite, franklinite, magnetite, and chrysotile. Clearly the initial sample was not very “pure” and included every constituent of the rock. Accordingly, a second sample was taken, using a hammer and nail to selectively chip out grains of the amber-brown mineral. The fragments were tested under LW UV to confirm their yellow fluorescence. They were then crushed and the franklinite and magnetite removed using a strong magnet. The resultant, purified sample was X-rayed and proved to be chrysotile, along with a little calcite and dolomite.
THE SEARCH FOR MORE

The results documented above prompted one of us (JVF) to search for more examples in local collections, at mineral shows, and from online mineral vendors. It now appears that fluorescent serpentine from the local area are at least modestly common, but their generally dim fluorescence and common admixture with other minerals, chiefly calcite, have largely prevented their recognition. Figures 5 through 8 show some of the specimens obtained thus far. In each of them, XRD of the fluorescent material confirmed chrysotile as the chief mineral constituent. Additional specimens (Figs. 10-14) were made known to us by Richard Bostwick as this article was in preparation; these have not been X-rayed and thus are sight-identified only as serpentine. To date, we have examined nearly two dozen specimens of fluorescent serpentine from the local area and feel confident that many more exist. Fluorescent serpentine has now been recognized from Sterling Hill (Figs. 1-12), Franklin (Figs. 13 and 14), and from one of the local quarries (not shown).
Among the local serpentine specimens examined to date, chrysotile that occurs as a component of chrysotile-calcite veins and as coatings on fracture surfaces is most likely to fluoresce; the occurrences recognized to date come mostly from Sterling Hill. The most common associated minerals are calcite, dolomite, sphalerite, and franklinite. Massive material that formed as replacements of precursor minerals in the rock matrix is less likely to show any response. Collectors might profit from examining Sterling Hill serpentine specimens in their own collections with a longwave UV lamp and some patience, preferably in a very dark room. The fluorescent response is “mild” at best.
Incidentally, fluorescent serpentine is not especially rare on a worldwide basis, as shown in part by the number of localities (11) listed by Dr. Gerhard Henkel (Verbeek and Modreski, 1989). The most common fluorescent response recorded by Dr. Henkel for fluorescing serpentines was cream to yellow or white LW, similar to that of our local material. The common massive green serpentines that form the main component of the rock *serpentinite*, often quarried as a decorative facing or carving stone, are the least likely to fluoresce, probably because the same iron (substituting for magnesium) that gives most such serpentine its green color also deters its fluorescence. Much more likely to show fluorescence are serpentines that in daylight are of pale to medium brown color, like our local examples and the "dewyelite" from the State Line chromite district along the Pennsylvania-Maryland border.

All photos by Earl R. Verbeek

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REFERENCES


